CORPORATE FORECASTING

ASSESSING RETAIL DEVELOPMENT IN EDMONTON

USE OF THE RETAIL IMPACT MODEL

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by

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IMPORTANT NOTE

This Technical Paper has been prepared by the Corporate Forecasting Group, Long Range Planning Branch, Planning and Building Department. The Paper documents research results as part of an ongoing assessment activity. Neither the methods or results have been endorsed by the City of Edmonton.

ASSESSING RETAIL DEVELOPMENT IN EDMONTON

Use of the Retail Impact Model

1. PURPOSE AND OBJECTIVES

This paper has been prepared to describe and illustrate through an actual application the Retail Impact Model owned and maintained by the City of Edmonton Planning and Building Department.

The Retail Impact Model allows measurement of the sales effects of major retail development proposals and aids in the examination of some land use planning elements influencing retail developments. Sales effects are determined through a comparison of model outputs, specifically, sales and market share estimates for each shopping centre operating or planned for the Edmonton regional market. The outputs provide a relative assessment of how well each shopping centre is expected to perform.

Use of the model also allows an examination of the implications of varying land use related elements such as population, employment, the nature and size of retail development and consumer travel times between centres. These variations, expressed in terms of the model outputs - changed sales levels and market shares for each shopping centre - are then used to assess the land use planning implications of new retail proposals. To a limited extent, the model can also be used to evaluate the implications of Edmonton General Municipal Plan retail policy changes.

A section on the anticipated impacts of the new Mill Woods Town Centre is provided as an example of the application of the model. The discussion includes a description of the Mill Woods area and its key market characteristics, a brief description of the Mill Woods Town Centre proposal and its associated market impacts.

Also included is a discussion on the sensitivity of the model and some of the limitations to be considered in the interpretation of model results.

Although the Retail Impact Model was constructed and programmed by consultants retained by the City of Edmonton Planning and Building Department, the responsibility for its maintenance, its data base and, more importantly, the interpretation of results lies with Planning and Building Department staff.

2. RETAIL MODEL THEORY

The basis for retail impact analysis is drawn from academic research which started over 50 years ago and has been modified and detailed over time. The following section identifies some of the key individuals and their thoughts and contributions to retail analysis. The section also presents the theoretical underpinnings of the Edmonton Retail Impact Model.

2.1 History

The basis for present retail models can be traced to early gravity models which defined the size of a city and the distance from which shoppers are attracted. For example, W. J. Reilly's theory of 1929 explained the attraction of adjacent centres exerted on intervening smaller communities and formed the basis for evaluating consumer purchase decisions. This model was revised and lead to the trade area analysis put forth by Christaller in 1930.

Christaller in his central place theory established a link between retail location studies and marketing or consumer behaviour. A major conclusion was that the cost of a good will increase with the distance from a central place until a threshold is reached. Beyond that threshold, consumer purchases of the good in question from that location is no longer likely.

Losch (1938) adopted similar assumptions to those of Christaller and produced a spatial pattern of supply locations, establishing the size of the trade area around first a single centre and then a system of market areas. This work allowed specification of individual market areas based on the sales required to make production of a good viable.

A major contribution to retail modelling was completed in 1959 by Berry. His typology produced a reformulation of the central place theory with a spatial classification in an attempt to organize commercial patterns. Berry's model stressed that the principles of size differentiation and numerical hierarchy were gross oversimplifications in that commercial development was classified in nucleated centres, ribbon developments and special function areas.

Later research has refined these and other earlier models. Luce in 1959 established that consumers do not appear to select one alternative consistently. A lack of consistency in choice becomes apparent where there are a large number of shopping centres of various sizes within a reasonable distance.

One of the more recent contributions to retail modelling was completed by Huff in 1963. He suggested that areas of competition between shopping centres continually overlap and that there was a probabilistic element in consumer behaviour.

All of these models require similar variables in order to measure effects on market area. The two principle variables that exert enough influence to allow their use as proxies for all other variables in making predictions are:

a) the number of items that are carried by a shopping centre (often represented by floorspace), and
b) the travel time to each shopping centre.

2.2 The Retail Impact Model

The Retail Impact Model uses seven key variables - floorspace, travel time, population, employment, incomes, anchor tenants and intervening opportunities in three basic equations to estimate the total annual sales per square metre for each shopping centre. The model begins by estimating the market share that each shopping centre is likely to attract from each residential area, given its particular attributes. It then calculates the total potential expenditures that consumers from each residential zone will generate for each year in question. By allocating consumer expenditures based on estimated market shares, the model generates an estimate of total sales per square metre for each shopping centre.

The equations used in the model, along with an explanation of each expression are described below.

Market Share

This equation estimates the market share of department store type merchandise (DSTM)* expenditures attributable to each shopping centre in each year.

The market share of each department store is a function of the variety of goods (represented by the amount of floorspace and attractiveness of the major tenants) and the inverse of the distance the consumer has to travel (the time spent travelling and the possibility of obtaining services from a closer location).

$$(1) \quad M_{ijt} = \frac{D_{it} \times B_{it}}{T_{ijt} \times I_{ijt}}$$

where M_{ijt} = the market share of shopping centre i in zone j in year t,

D_{it} = the amount of DSTM floorspace in shopping centre i in year t,

B_{it} = the anchor tenant bonus for shopping centre i in year t,

T_{ijt} = the travel time between shopping centre i and zone j in year t, and

I_{ijt} = the intervening opportunities (IVO) factor between shopping centre i and zone j in year t.

The DSTM floorspace in each shopping centre is factored up by the appropriate bonus multipliers associated with that centre's anchor tenant(s). The bonus multiplier is used to distinguish the relative attractiveness of each department store to Edmonton consumers. This value is divided by the modified travel time between each shopping centre and residential zone. The modified travel time is the actual calculated travel time between a central location in a residential zone and a shopping centre factored by the number of intervening opportunities that might be presented to a consumer who is travelling between that zone and shopping centre.

*Department Store Type Merchandise includes family clothing and apparel, furniture, appliances and home furnishings and miscellaneous commodities excluding food sales.

Expenditure Potential

This equation is used to calculate the total potential sales available for DSTM expenditures at each centre in each year;

The potential sales available for DSTM expenditures is a function of the population in each residential area, the number of employees in immediate proximity to a retail facility, consumer incomes, the amount they spend on average on department store type merchandise and the amount of purchasing they typically make at shopping centres as opposed to other retail opportunities.

(2) $P_{jt} = PO_{jt} \times EM \times IN_j \times DSTM_t \times SH$

where P_{jt} = the shopping centre share of potential DSTM sales from zone j in year t,

PO_{jt} = the population of zone j in year t,

EM = the number of employees near retail facilities,

IN_j = the per capita income index value of zone j,

$DSTM_t$ = the average per capita DSTM expenditure in the Edmonton CMA in year t, and

SH = the share of total DSTM potential served by shopping centres identified in the model.

An estimate of the DSTM expenditures generated from each zone in the Edmonton region is arrived at by multiplying the number of people and the number of employees by the average per capita DSTM expenditures. This is then modified on a geographic basis within the region by multiplying this estimate by the per capita income index. The result is an estimate of spending power by residential zone throughout the market area. This estimate is further modified by a factor representing the share of total DSTM expenditures that are expected to be made at shopping centres identified in the model.

Shopping Centre Sales

This equation estimates the total sales per square metre for department store type merchandise at each shopping centre in each year;

$$(3) \quad S_{it} = \frac{\frac{R_{it}}{(1 - F_i)}}{D_{it}}$$

where S_{it} = the DSTM sales per square metre of floorspace for shopping centre i in year t,

R_{it} = the total potential DSTM sales of shopping centre i from all zones j in year t,

F_i = the percentage of total DSTM sales of shopping centre i derived from persons living outside the regional market area, and

D_{it} = the amount of DSTM floorspace in shopping centre i in year t.

The results from the initial two equations - the market share of each shopping centre and the potential DSTM sales available are combined to form an estimate of the potential DSTM sales that are likely to be made at each shopping centre from each residential area. This is then adjusted upward to take into account all DSTM sales to persons originating from outside the regional market area. When the total sales for each shopping are divided by the amount of DSTM floorspace in each, the result is an estimate of sales per square metre for each major retail facility in the Edmonton area.

3. MODEL STRUCTURE - INPUTS

In order to calculate the market performance of each major shopping centre in Edmonton the following information is required. The source for each data entry is also indicated along with its frequency of revision.

1) Present and future population by residential zones to describe the size and location of the Edmonton market, (Appendix A). The population source is from the small area forecasts prepared by the Corporate Forecasting Group on a semi-annual basis projected in April-May and October-November.

2) Shopping centre size measured in gross leasable area (GLA), (Appendix B). This is used in weighing the attractiveness of a centre to the consumer. These figures are taken from reports prepared by the model designer and updated through discussions with management of the different shopping centres as changes occur.

3) Major anchor tenants (departments stores) of each shopping centre, (Appendix C). The anchor tenants are used to weigh the 'strength' of each centre and the actual weighting is achieved using bonus multipliers. A numerical value is given to each anchor to approximate its relative attractiveness to consumers. This data was prepared initially by the model designer and is updated as changes occur to the attractiveness of anchors in Edmonton.

4) Office space within two blocks or a reasonable walk from the mall. This information is converted to an estimate of employees to adjust market calculations to take employment levels into account in market assessment. The source of the information is from the business assessment files and it is updated annually.

5) Estimated consumer travel times from residential zones to each shopping centre, (Appendix D). Travel times are calculated by factoring travel distances on a map to represent travel times. They are estimated using the most direct route from a zone to a centre along major city arterials. This is updated as changes occur in the transportation system, as the shopping centre network changes or as residential patterns change.

6) Intervening opportunities by other shopping centres offering similar levels of retail goods and services between a residential zone and a specific shopping centre, (Appendix E). A shopping centre is considered to be an intervening opportunity if it lies within a 3 kilometre wide band on a straight line between a zone and a destination shopping centre. Intervening shopping centres are identified using a map and template and are updated as changes occur in the retail hierarchy.

7) Per capita average income data, indexed by residential zone, (Appendix F). This information is taken from Statistics Canada data and is updated every five years.

8) Average per capita consumer expenditure estimates, (Appendix G). This information is obtained annually from consultants who regularly submit work to the city or major retail development proposals.

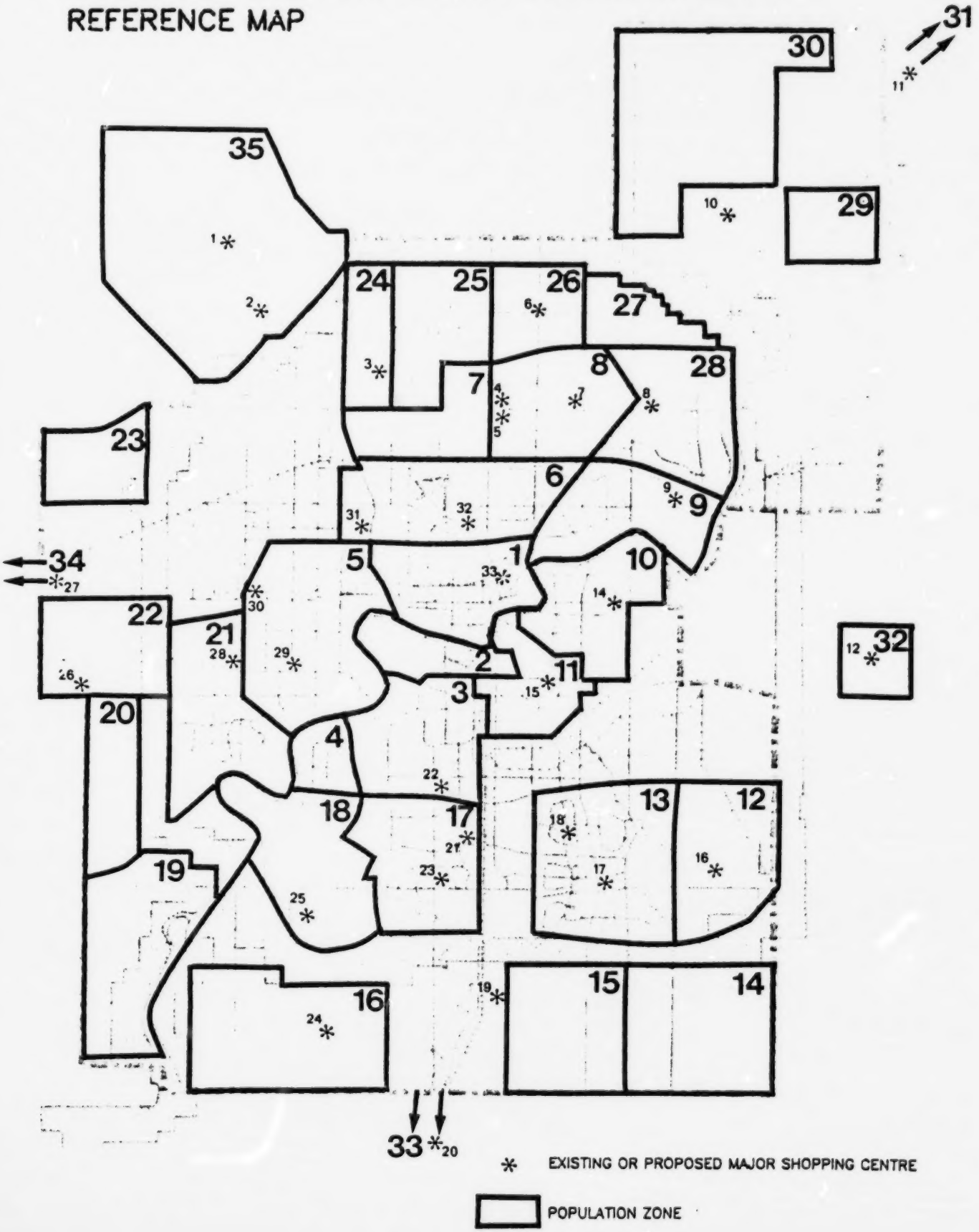
9) Retail expenditure growth rate estimates, (Appendix H). This data is prepared annually based on current forecasts available from several sources such as retail consultants, economic forecasts such as the Conference Board's or the City's Corporate Forecasting Group.

Map 1 shows the location of the 35 residential zones, as well as identifying 33 existing and potential shopping centres in the city and surrounding communities.

The retail model uses the equations in Section 2.2 to calculate the number of dollars that consumers will likely spend in the forecast years and allocates those dollars to individual shopping centres as sales. The model calculations are based upon the size of the centre (assuming bigger centres are more attractive), the type of department store (assuming consumers find some retailers more attractive than others), travel times to each centre (assuming closer centres would likely be visited more often), the incomes of residents living near each centre (assuming higher incomes mean higher expenditures), and the time taken to shop (assuming intervening shopping opportunities will be visited more often than other neighbouring shopping centres).

MAP I

EDMONTON SHOPPING CENTRE COMPUTER MODEL REFERENCE MAP



POPULATION ZONES

Zone 1:	Downtown	Zone 19:	Far Southwest
Zone 2:	University	Zone 20:	Parkland
Zone 3:	Southgate	Zone 21:	West Jasper Place
Zone 4:	North Riverbend	Zone 22:	Lewis Farms
Zone 5:	Jasper Place	Zone 23:	Big Lake
Zone 6:	North Central	Zone 24:	Northwest Edmonton
Zone 7:	Calder	Zone 25:	Castle Downs
Zone 8:	Londonderry	Zone 26:	Lake District
Zone 9:	Beverly	Zone 27:	Pilot Sound
Zone 10:	Capilano	Zone 28:	Clareview - Hermitage
Zone 11:	Bonnie Doon	Zone 29:	Far Northeast I
Zone 12:	The Meadows	Zone 30:	Far Northeast II
Zone 13:	Mill Woods	Zone 31:	Fort Saskatchewan
Zone 14:	Far Southeast	Zone 32:	Sherwood Park
Zone 15:	Ellerslie	Zone 33:	Leduc
Zone 16:	Heritage Valleys	Zone 34:	Spruce Grove
Zone 17:	Kaskitayo - Twin Brooks	Zone 35:	St. Albert
Zone 18:	South Riverbend - Terwillegar		

EXISTING OR PROPOSED MAJOR SHOPPING CENTRES

SC 1:	St. Albert	SC 18:	Millbourne
SC 2:	Village Tree	SC 19:	Ellerslie
SC 3:	Northwest Edmonton	SC 20:	Leduc
SC 4:	North Town	SC 21:	South Park Village
SC 5:	Northwood	SC 22:	Southgate
SC 6:	Lake District	SC 23:	Heritage Mall
SC 7:	Londonderry	SC 24:	Heritage Valley
SC 8:	Clareview	SC 25:	Riverbend - Terwillegar
SC 9:	Abbottsfield	SC 26:	Lewis Farms
SC 10:	Northeast Edmonton	SC 27:	Westland Mall (Spruce Grove)
SC 11:	Fort Saskatchewan	SC 28:	West Edmonton Mall
SC 12:	Eastgate	SC 29:	Meadowlark
SC 13:	Sherwood Park	SC 30:	Centennial Village
SC 14:	Capilano	SC 31:	Westmount
SC 15:	Bonnie Doon	SC 32:	Kingsway Garden Mall
SC 16:	The Meadows	SC 33:	Downtown Edmonton
SC 17:	Mill Woods		

4. ANALYTICAL FRAMEWORK

The three basic equations used to estimate the sales performance of Edmonton shopping centres in the Retail Impact Model have been identified in Section 3. However, the model actually goes through seven steps to calculate the total estimated DSTM sales per square metre for each shopping centre. These steps are as follows:

(i) The model calculates an adjusted size for each shopping centre based on the gross leasable area of each centre in a given year, the proportion of DSTM floorspace in the centre and the anchor tenants.

(ii) The model next calculates the share of potential DSTM sales that are likely to be generated from each zone in each year of the forecast. Taken into account are the resident population, local employment based on office space, average incomes, average per capita DSTM expenditures and the overall percentage of potential DSTM sales likely to be captured by shopping centres.

(iii) The intervening opportunities (IVO) effect between each zone and each shopping centre is then computed using a binary value indicating whether a shopping centre does or does not intervene between a given shopping centre and a residential zone, the size of the shopping centre and a constant that is derived using the license place survey results.

(iv) The intervening opportunity calculations are followed by a calculation of the market share of each shopping centre in each zone in each year. The model uses the adjusted shopping centre size calculated in (i) for each centre in each year and adjusts it by the travel time between shopping centres and residential zones and the IVO factor.

(v) Sales for each centre by year of forecast are then calculated by allocating the potential sales calculated in (ii) above based on the market shares identified for each centre in each zone.

(vi) The sales for each centre are then adjusted to account for inflows into the regional market area. These inflows are derived from the license plate survey.

(vii) The total estimated DSTM sales per square metre of gross leasable floor area is calculated by dividing the total sales for a given shopping centre in one year by the calculated shopping centre sizes adjusted by the percentage of floorspace used for DSTM type goods.

Model Calibration

Periodically, as a result of changes in consumer spending patterns, the shopping centre hierarchy or the locations of new residential and commercial development, the Retail Impact Model must be recalibrated. Recalibration is performed by adjusting the size of the primary trade area each mall creates. The actual variable that is adjusted to recalibrate is the constant in the IVO factor equation.

Changes to the IVO factor are derived from consumer affiliation data collected through a license plate survey. The survey involves the collection of over 2000 license plate observations from 19 shopping centre locations over a 3 day period. The actual number of observations at each centre varies with the size of the centre but observations are taken at a variety of times over the 3 day period to remove any time bias. When the license plates are converted to registrant addresses, the data provides information on consumer affiliations to the shopping centre and consumer inflow rates from outside the regional market.

Table 1 presents date collected from the October 1985 license plate survey. The table shows the percentage of automobiles originating from each residential zone which were observed at shopping centres. For example, 3% of the vehicles at St. Albert Centre were owned by registrants from zone 1 (Downtown). Vehicles originating from outside the regional market area visiting a shopping centre are identified as a percentage of all other vehicles counted at that centre. This data essentially quantifies the affiliation consumers have with each major shopping centre in the Edmonton region.

The results of the survey are compared to the base year market shares for each shopping centre as calculated by the model. Variations in the intervening opportunity factor produce changes in the market shares and by varying the IVO factor, the market share can be adjusted to the point where it most closely replicates base year consumer affiliations.

TABLE 1
Consumer Affiliations to Edmonton Shopping Centres
Results from the 1985 Licence Plate Survey

	CENTRE									
ZONE	1 STABLG	2 VTREE	4 NTOWN	5 NWOOD	7 LDERY	9 ABBOT	12 EGATE	14 CPAPIL	15 BDOON	18 MILE
1	.03[1]	.01	.03	.08	.05	.02	.01	.03	.03	.04
2	0	0	0	.05	0	0	0	.10	.05	0
3	0	0	0	0	.01	0	0	.03	.04	.04
4	0	0	0	0	0	0	0	0	0	.03
5	.02	.01	.01	.02	.01	.01	.01	.01	.02	.01
6	.04	.01	.07	.04	.04	0	0	.01	0	.01
7	0	0	.10	.55	0	0	0	.03	.06	0
8	.03	0	.17	.16	.33	.03	.01	0	.01	0
9	0	0	.05	.03	.12	.44	.02	.09	.02	.02
10	0	0	.02	.05	0	.02	0	.28	.23	.04
11	0	0	.02	.02	.05	.02	.02	.05	.36	0
13	0	0	.01	.01	.01	0	.03	.08	.10	.30
17	.03	.01	0	0	0	0	.01	.01	.04	.04
18	0	0	0	0	0	0	0	0	0	0
21	.04	0	.01	.03	.04	0	0	0	0	0
25	0	.02	.20	.19	.12	.10	.02	.02	.03	0
26	0	0	.20	.30	.20	.10	0	0	0	0
28	.02	0	.15	.18	.18	.17	.01	.04	.04	0
31	0	0	0	.13	.40	.07	0	.07	0	0
32	0	0	.03	.03	.02	.02	.46	.05	.20	.01
33	0	0	0	0	0	0	0	.08	0	0
34	.06	0	.12	0	0	.06	0	0	0	0
35	.38	.33	.01	.03	.03	0	0	0	.01	.01
OUTSIDE	.228[2]	.227	.089	.12	.167	.154	.177	.051	.088	.075

NOTE: Percent inflow figures by centre are identified from the percentage of automobiles visiting each shopping centre that are registered to addresses outside of the regional market as defined by the zones identified in the retail model.

Interpretation: Box 1: Three percent of consumers originating from zone 1 shop at St. Albert Centre. Box 2: Approximately 22.8 percent of visitors to St. Albert Centre live in areas outside of the Edmonton region.

See Map 1 for zone boundaries and locations of shopping centres.

Source: Edmonton Planning and Building Department, Licence Plate Survey, October 1985.

TABLE 1 (Contd.)

ZONE	CENTRE									
	21 SPVIL	22 SGATE	23 HERIT	28 WEM	29 MLARK	30 CENT	31 WESTM	32 KINGS	33 CBD	TOTAL
1	.01	.07	.04	.05	.01	.04	.12	.12	.24	1
2	.14	.05	.19	.10	0	.05	0	.10	.19	1
3	.12	.32	.10	.05	.01	.03	.03	.03	.19	1
4	.06	.28	.16	.16	.10	.06	.03	0	.13	1
5	.02	.03	.01	.13	.23	.17	.16	.03	.08	1
6	.01	0	.03	.07	.01	.05	.25	.20	.15	1
7	0	0	0	0	.03	0	.10	.03	.10	1
8	0	.02	.01	.05	.03	0	0	.10	.05	1
9	0	0	.02	.03	0	.02	.02	.09	.06	1
10	.01	.04	.01	.04	.02	.02	.03	.03	.15	1
11	.05	.05	.07	.05	0	.02	.05	.12	.05	1
13	.03	.06	.17	.02	.03	.01	.02	.03	.01	1
17	.14	.24	.30	.04	.01	.02	.03	0	.09	1
18	0	0	0	0	0	0	.1	0	0	1
21	.05	.04	.03	.28	.17	.11	.09	.05	.06	1
25	.03	0	.02	.07	0	.02	.02	.08	.07	1
26	0	0	0	0	0	0	0	.10	.10	1
28	0	0	0	.02	.01	.01	.03	.06	.07	1
31	0	0	0	.13	0	0	.07	.07	.07	1
32	.01	.04	.03	.01	0	.01	.02	.03	.04	1
33	.08	0	.50	.08	.08	0	.08	.08	0	1
34	0	0	0	.41	0	.12	.12	.06	.06	1
35	0	.01	.01	.05	.01	.01	.05	.03	.04	1
OUTSIDE	.092	.138	.101	.237	.064	.192	.136	.180	.147	

See Map 1 for zone boundaries and location of shopping centres.

Source: Edmonton Planning and Building Department, Licence Plate Survey, October 1985

5. MODEL STRUCTURE - OUTPUTS

The retail model generates market share and estimated department store type merchandise (DSTM) sales figures for each retail centre over a 20 year projection. In the 1986 base scenario, which forms the basis for the current forecast for future retail activity, five new shopping centres are assumed to be built in the next 20 years; Eaton Centre (1988), Mill Woods (1988), Spruce Grove (1993), Lake District (by 2000) and Palisades (by 2006). Expansions are anticipated at South Park Village (1987), Manulife (1988), Eaton Centre (1989), Kingsway (1990) and Mill Woods (1991).

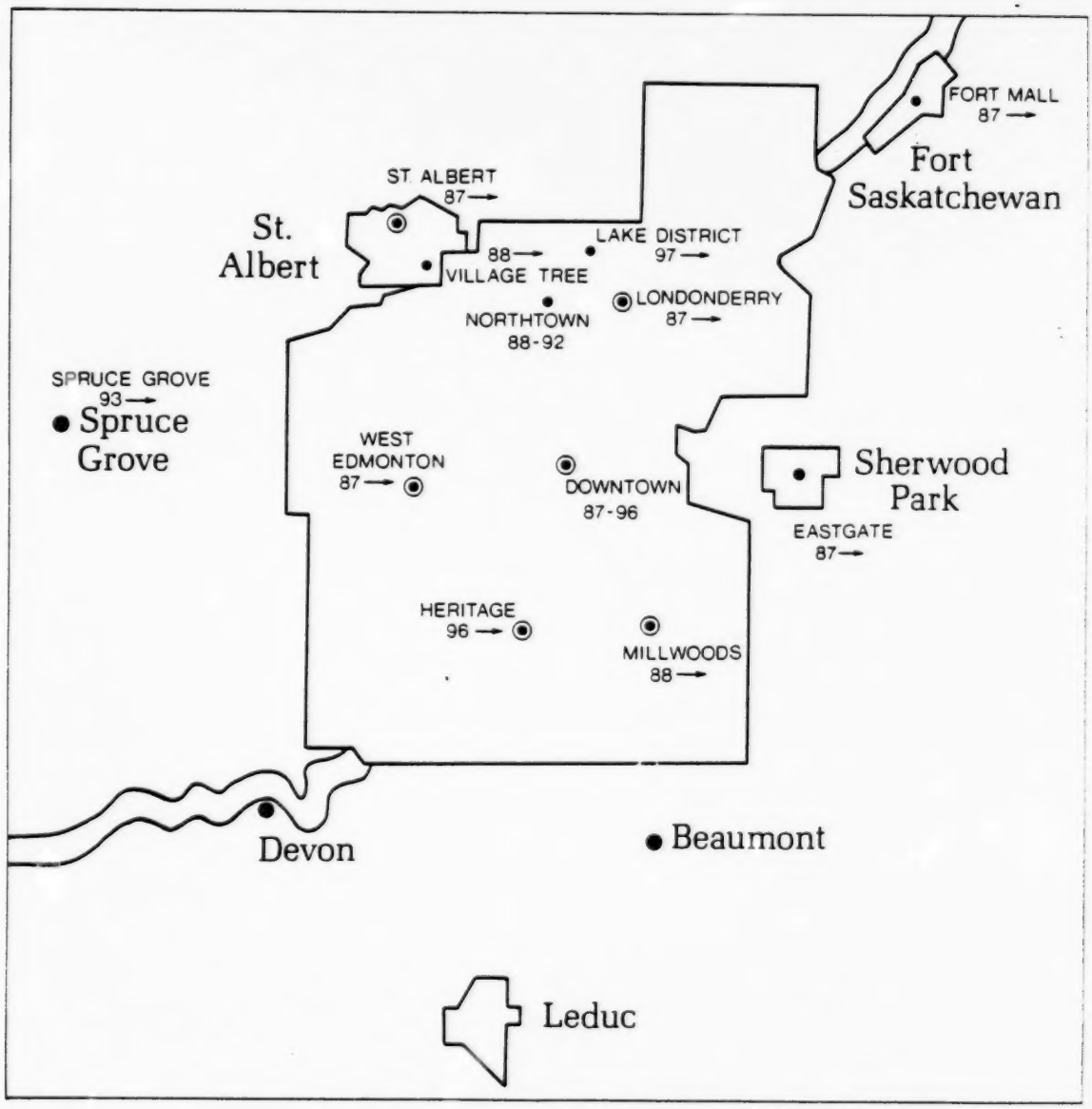
In terms of performance, the best sales per square metre among the regional shopping centres are received by Downtown, Londonderry, St. Albert Centre and West Edmonton in 1986. (Map 2 and Graphs 1 and 2). The Mill Woods Town Centre is projected to join the group of above average performers when it opens in 1988. By 1996, the downtown is expected to drop slightly below average in projected sales per square metre but that may not necessarily reflect a lack of development opportunities as much as an inability to identify viable projects for downtown retail expansion beyond ten years.

Among community shopping centres, Eastgate is projected to consistently perform at above average along with the Fort Saskatchewan centre and Village Tree Mall in St. Albert. Millbourne in Mill Woods and Capilano Mall are above average producers in 1986 and 1987 respectively until the Mill Woods Town Centre opens in 1988. The Town Centre is projected to be an above average performer by 2001. The Spruce Grove Mall has a strong potential to attract above average sales upon opening in 1993. Given this good performance, it might open earlier.

Total gross leasable floor area (GLA) in regional and community shopping centres in the Edmonton region in 1986 is estimated to be 1,044,800 square metres. This is expected to grow to 1,207,300 square metres by 1991. Total DSTM expenditures per capita in 1986 are estimated to be $2,490. This implies total DSTM expenditures of $2.4 billion for the Edmonton region in 1986 including externally generated shopping expenditures and an average DSTM expenditure per square metre of gross leasable of $2,300 or $213.50 per square foot.

MAP 2

PROJECTED ABOVE AVERAGE PERFORMANCE
REGIONAL & COMMUNITY SHOPPING CENTRES
1987 - 2005

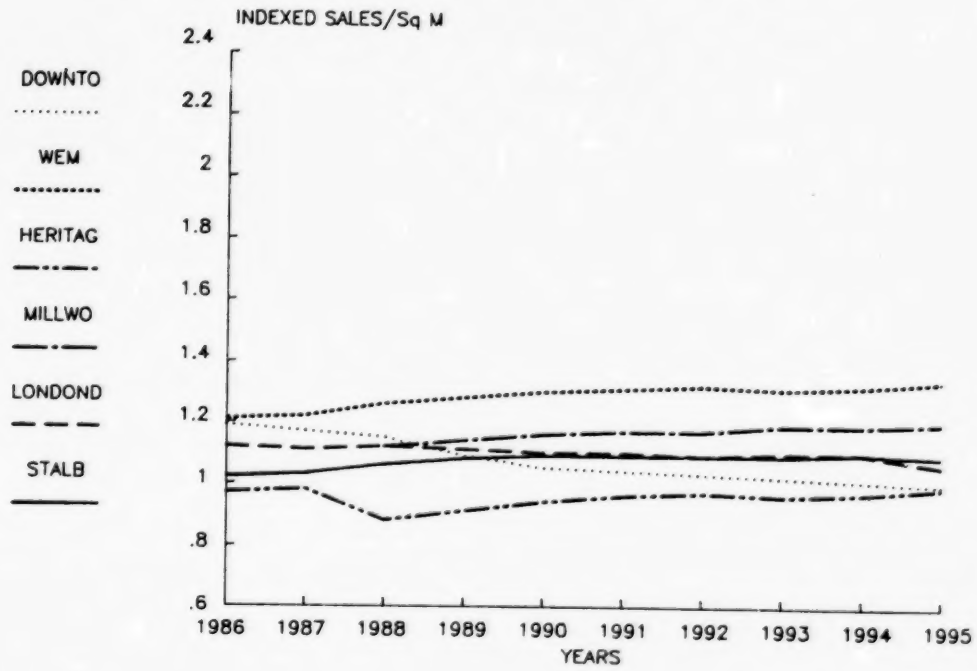


- Above Average Performing Community Shopping Centre
- Above Average Performing Regional Shopping Centre

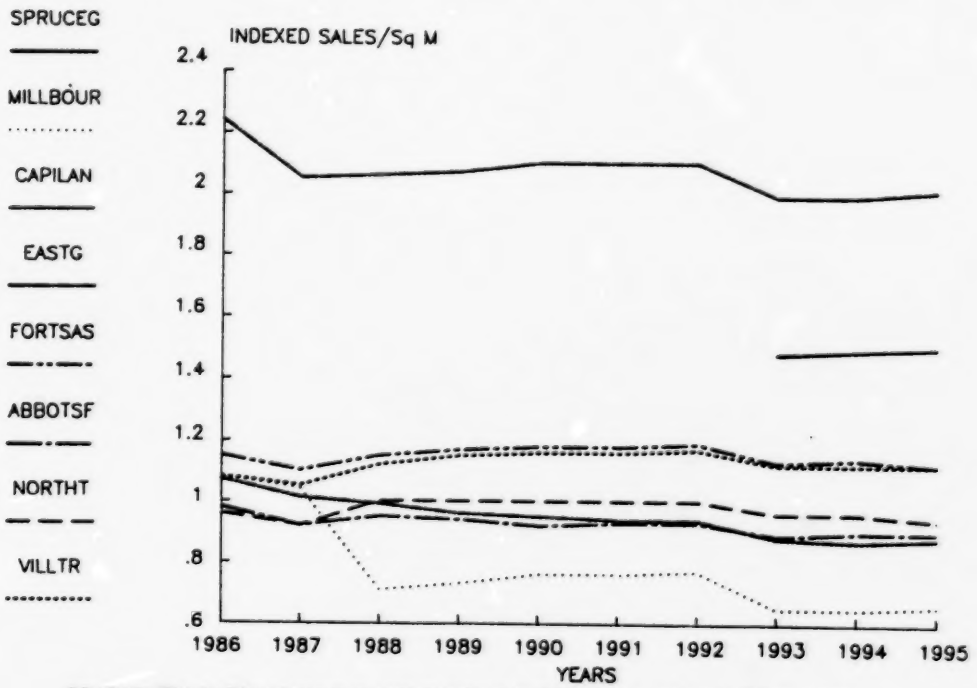
Years signify period of above average performance

Source: 1986 Base Run, Retail Impact Model

GRAPH 1– ABOVE AVERAGE SALES PERFORMERS FOR REGIONAL SHOPPING CENTRES



GRAPH 2– ABOVE AVERAGE SALES PERFORMERS FOR COMMUNITY SHOPPING CENTRES



SOURCE: EDMONTON PLANNING AND BUILDING DEPT., RETAIL IMPACT MODEL,1986

To give some indication of the market shares assigned to various shopping centres in the Edmonton region, West Edmonton Mall is estimated to capture about 37% of the total DSTM expenditures made in Edmonton in 1986. The Downtown is estimated to capture about 14% of the total DSTM expenditures. Over the next five years to 1991, the Downtown share is expected to increase to about 17% with the completion of the Eaton Centre and Manulife Phase II buildings. West Edmonton continues to capture an estimated 35% of the total DSTM market.

5.1 Validity of Model Outputs

One of the fundamental assumptions to the Retail Impact Model is that it provides a realistic simulation of the relative performance of each shopping centre. However, there are no direct means of evaluating this assumption because sales and other shopping centre specific indicators of performance are not available. As a result, several indirect methods have been used to assess model outputs.

Clareview Town Centre is a planned retail facility that offers indirect evidence that the model outputs are valid. Planned in the early 1970's the Clareview Town Centre was to be anchored by a regional shopping centre that would develop in the late 1980's. The Model indicates that no market exists for the Clareview Shopping Centre partly because it was pre-empted by the Londonderry Shopping Centre and partly because of the insufficient levels of development in the northeast. No plans are currently underway to develop a regional shopping centre at Clareview and this is accepted as validation of model outputs which indicate no opportunity exists.

Despite the large increments of new retail floorspace in recent years, the Retail Impact Model has identified several remaining opportunities for new shopping centre development. The regional shopping centre in the Mill Woods Town Centre is a good example. The model identifies Mill Woods as an excellent retail development opportunity despite the poor economic climate, recent major floorspace expansion at West Edmonton and in the Downtown and the existence of recently developed and remerchandised shopping centres to the immediate west of the Mill Woods area. Cambridge Shopping Centres Ltd.

is currently pre-leasing the Mill Woods Town Centre retail component and anticipates opening in August 1988. This is seen as support of the ability of model outputs to identify legitimate development opportunities.

Finally, the development of Phase III of West Edmonton provides examples of a centre which generated negative impacts on existing and planned retail facilities. Significant negative impacts were identified for Centennial and Meadowlark shopping centres that would require role changes for the centres if they were to continue as retail land uses. Since Phase II opened, these centres have undergone role adjustments. Meadowlark has begun to bill itself as the "Neighbourhood Shopping Centre" and it has emphasized the convenience of its location and goods to compete with the comparison orientation at West Edmonton. Centennial did not adjust immediately and it has continued to lose tenants and customers over a longer period of adjustment. A role adjustment has started with the replacement of the Canadian Tire anchor with a recreational vehicle dealer. A more complete remerchandising and role adjustment appears necessary.

Four other shopping centres were identified as having marginal negative impacts. Westmount experienced the greatest decline in sales of the four, resulting in a remerchandising and expansion in 1985. Village Tree and St. Albert Shopping centres have lost customers and tenants as well, although no remerchandising has been evident. Finally, Southgate had difficulty in filling up its newly added retail space in 1982 and 1983 after Phase II of West Edmonton was completed. However, most of its adjustments have not included physical changes because of the major expansion completed in 1981 and 1982.

From this example, the model can be used to identify when major physical changes are likely to occur and when other less extensive changes might be more appropriate. The less extensive changes are usually the most difficult to predict with any accuracy because the options open are often either physical, operational or a combination of each.

The above examples are sufficient to justify acceptance of the Retail Impact Model as a realistic simulation of the relative performance of shopping centres in the Edmonton region. At the same time they help to illustrate some of the

limits associated when applying the model and situations where correct interpretation of outputs is subject to many other factors not accounted for in the model.

6. MODEL APPLICATION - THE MILL WOODS TOWN CENTRE

An assessment of The Mill Woods Town Centre provides an example of how the Retail Impact Model is applied and the results interpreted. The impact assessment first describes the Mill Woods area and retail market characteristics. It then describes the Mill Woods Town Centre project and the impact of the development proposal on adjacent retail facilities - both planned and existing. The analysis concludes with a brief discussion of the model and some analytical limitations.

Mill Woods is a suburban residential area located in Edmonton's southeast. It is bounded by 34 and 95 Streets on the east and west and Whitemud Drive and 10 Avenue on the north and south. It is adjacent to industrial land uses to the north (Southeast Industrial) and west (South Industrial), a developing residential area to the east (The Meadows) and a planned residential area to the south (Ellerslie).

The population of Mill Woods as of May, 1986 was 64,646. Given the current population, the amount of developable land remaining and the low average family sizes, it is doubtful that Mill Woods by itself will ever reach 100,000, but it is likely the primary trade area will reach that figure and more as adjacent residential areas develop. The Meadows and Ellerslie had resident populations of 450 and 281 persons respectively in 1986. By 2005, growth in all three areas is projected to result in a population of over 104,000 persons. About 74% of Mill Woods residents are under 35 years old compared to 62% of Edmonton residents. In terms of purchasing power, incomes in Mill Woods in 1981 were approximately 90% of average for the Census Metropolitan Area (1981 Census).

Only one shopping centre exists within Mill Woods - Millbourne, a 17,200 square metre community sized retail facility anchored with a Zeller's store. Most consumer dollars generated by residents in the area are spent at neighbouring Heritage, Bonnie Doon and Southgate shopping centres.

In August of 1988, Cambridge Shopping Centres Ltd. plans to open the Mill Woods Town Centre. Phase I of the mall will be a 41,800 square metre

development anchored by a full line Woodwards Department Store and a currently unnamed junior department store. In addition, the mall will house about 125 specialty stores and services. A second phase with a second full line department store and more specialty retail outlets totalling some 16,700 square metres is anticipated within five to ten years of the initial development. (Source: Cambridge Shopping Centres Ltd.)

6.1 Market Impact

The market impact of the Mill Woods Town Centre project is identified by comparing the projected sales for each existing and planned shopping centre under two comparable scenarios. The difference between the scenarios is that in one, the proposed Mill Woods Town Centre develops as planned while in the other it does not develop. While this situation is hypothetical in that any unserved market would likely be captured through further development of a competing shopping centre, it is possible to estimate the location and magnitude of any market impacts associated with one particular development.

In terms of market impacts, the Mill Woods Town Centre proposal has potential to generate changes in retailing in Edmonton in three different but related areas:

a) alteration of trade areas;
b) changing projected relative performance of shopping centres; and
c) changing location and magnitude of sales impacts.

The opening of Mill Woods Town Centre will alter the primary, and to a lesser extent, the secondary trade areas of each existing and planned shopping centre in the Edmonton region. In general terms, the trade area claimed by the Mill Woods Town Centre in the base scenario is taken from five other shopping centres (Bonnie Doon, Southgate, Heritage, South Park Village, Millbourne) because Mill Woods is assumed to serve that trade area more efficiently given its location and convenience to consumers. As a consequence, those five shopping centres are forced to adjust their primary trade areas and similar adjustments continue throughout the regional market to affect all retail facilities.

With changes in the location of trade areas come changes in the size of trade areas and probable sales performance. Among regional shopping centres there are few changes between the two scenarios in terms of which shopping centres perform at above average levels. As illustrated in Graphs 3 and 4, Heritage, West Edmonton, Londonderry, the Downtown and later St. Albert remain above average performers. It is among community size shopping centres that the number of above average performers is altered by the development of a Mill Woods shopping centre. For example, Table 2 illustrates how North Town fails to become an above average performer without Mill Woods. Using criteria that a new shopping centre must attain above average sales within three years of development to justify construction suggests planned centres in the Palisades and Lake District are in jeopardy of not developing unless Mill Woods proceeds. Other centres such as Village Tree and Spruce Grove achieve above average performance levels, but for shorter periods of time within the planning period.

The magnitude of impact from the Mill Woods Town Centre varies with distance from the proposed location. The greatest impact, ranging from 29% to 38% of probable sales is felt by Millbourne shopping centre. This level of impact is significant and great enough to force a role adjustment on Millbourne - likely towards a convenience oriented shopping centre. The level of impact is not unanticipated for Millbourne and is likely the principal reason for major adjustments among community shopping centres throughout the region.

The next order of magnitude of negative impact is identified for Heritage, Bonnie Doon, Southgate and South Park Village. They are affected between 7% and 15% and while it is unlikely to be significant by itself on any one centre, it will probably lead to some operational adjustments, particularly when combined with impacts from other unanticipated developments.

Mill Woods Town Centre also has a positive impact on existing and planned shopping centres located in the northern part of the city within the regional market. Primarily as a result of trade area adjustments for each shopping centre, seven of fifteen of these north side shopping centres receive an increase ranging from 6% to 10% of probable sales likely to be received if Mill

TABLE 2

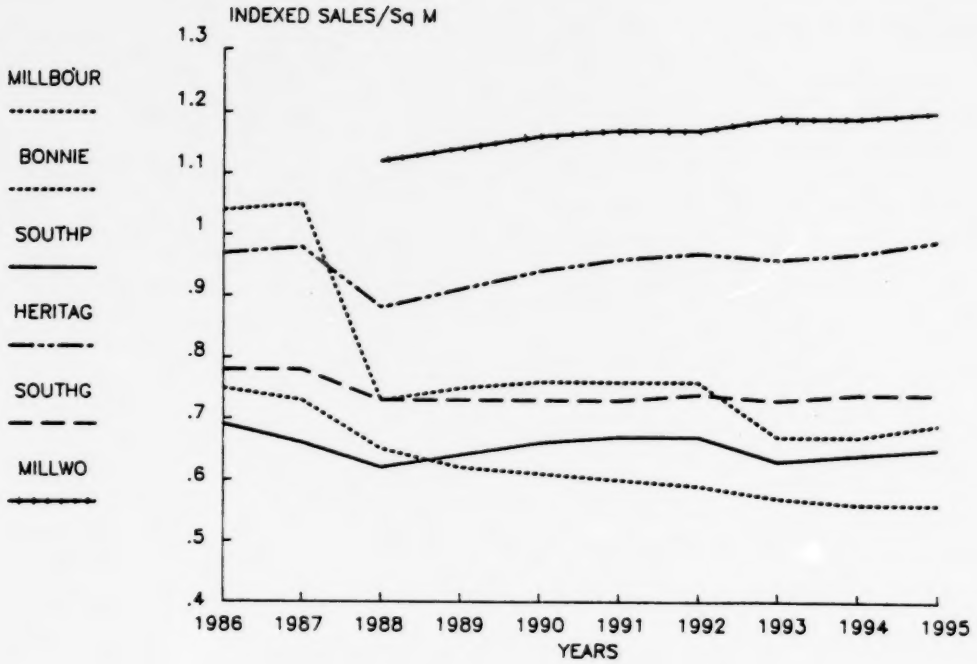
Market Impacts Attributable to the Mill Woods Town Centre

Negative Impacts	Range of Impact	Level of Impact
Bonnie Doon	8%-15%	Negative, possibly significant
Millbourne	29%-38%	Negative and significant
Southgate	7%- 9%	Negative, not significant
Southpark Village	7%-10%	Negative, not significant
Heritage	10%-13%	Negative, possibly significant
Positive Impacts		
Village Tree	6%- 7%	Positive
Palisades*	9%-10%	Positive
North Town	7%- 9%	Positive
Lake District*	7%- 9%	Positive
Spruce Grove*	8%-10%	Positive

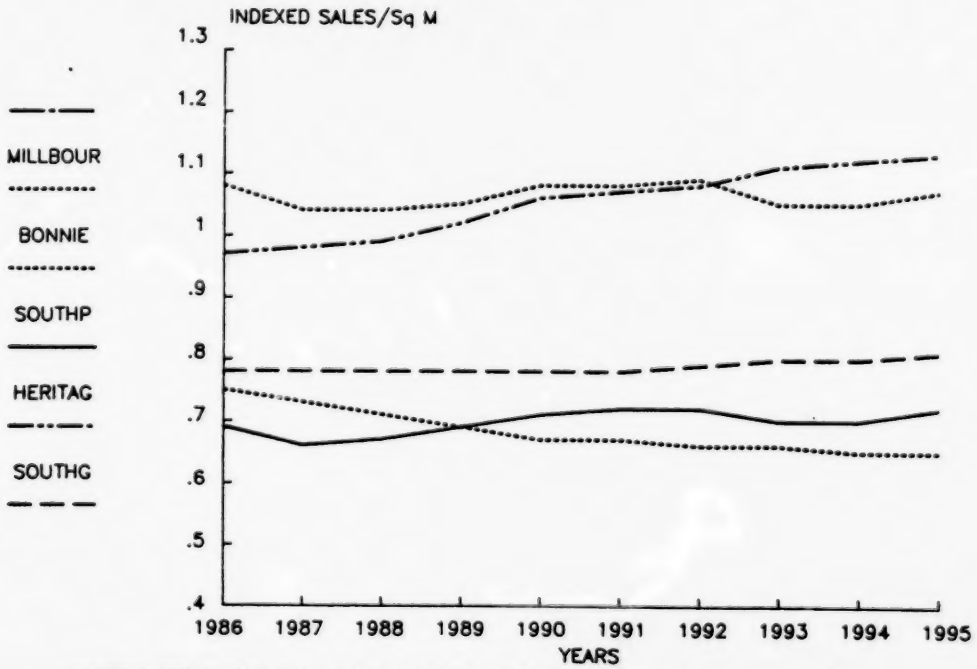
* denotes currently planned but unbuilt centre

Source: Edmonton Planning and Building Department, Retail Impact Model, October 1986

GRAPH 3–SHOPPING CENTRES SALES PERFORMANCE WITH MILL WOODS TOWN CENTRE DEVELOPMENT



GRAPH 4– SHOPPING CENTRES SALES PERFORMANCE WITHOUT MILL WOODS TOWN CENTRE DEVELOPMENT



SOURCE: EDMONTON PLANNING AND BUILDING DEPT., RETAIL IMPACT MODEL,1986

Woods was not developed. As with the changes in above average performance levels, all of the centres receiving a positive impact are community as opposed to regional facilities.

Table 5 identifies the centres affected by the new Mill Woods Town Centre, the nature and magnitude of the impact and a description of the level of significance.

6.2 Model Sensitivity and Limitations

While the retail impact model provides a series of outputs quantifying in detail the impact of new retail facilities on existing and planned shopping centres, there are limitations to the outputs that must be recognized.

First, there are limitations to the model because of the variables that it uses to assign estimated sales. Not all variables affecting consumer sales are accounted for specifically in the outputs of the model. For example, the model cannot account for many operational influences over sales such as marketing programs or productivity gains.

Second, there are limitations on the interpretation of consumer behaviour that are due to assumptions made in the model. The retail impact model, like most economic models, assumes that consumers select their shopping centres in a logical and highly rational decision making process that is sensitive to both large and small changes in market structure and operation. However, few consumers undertake as logical or as rational an approach as the model does in selecting a shopping centre. For example, if a major arterial to a mall in the southern half of the city is upgraded to a higher maximum speed limit, travel times will be affected. The model will show a slight change in trade areas for each shopping centre, even in the north, but there may not be a corresponding change in consumer behavior. As a result, consumer affiliations and reactions may be over estimated by the model, particularly when minor changes in structure or operations occur.

Third, the retail market and structure are dynamic while the analysis from the model is relatively static. The model may effectively measure the initial

impact attributable to the development of a new facility, but it is limited in measuring any operational or role related counter responses to that initial development. In essence, for every market change, there are several reactions from other market participants as malls compete for consumer dollars. The model is restricted in picking up these market changes.

Because there is little documented information available to verify the results of the model, the fourth limitation concerns the lack of quantitative certainty that is often assumed to be provided by a computerized model. The results must be interpreted using a relative analysis rather than using the calculated sales for each shopping centre as a certainty. Finally, the model simplifies the process of development of a new facility to the assumption that no new mall is justified unless it can achieve average sales performance within 3 years of development. In fact, there are many reasons why a mall might either proceed to be built or not develop at all which has very little or no relationship to anticipated sales. These might include financial or economic reasons which affect the developer of the mall and his ability to proceed with a project even though it may be a good investment on its own merits.

To account for these limitations, the analysis conducted on model outputs is relative. It judges the performance of any one mall in relation to all others. Secondly, the analyst assumes that impacts less than 15% are not likely significant. In actual application, an impact between 0% and 5% is not considered negative because it is within an acceptable range of "average". An impact of between 6% and 14% is considered negative but not necessarily significant. An impact of 15% or greater on sales is considered likely to be significant. The third means of accounting for and adjusting to these limitations is to specifically note limitations pertaining to any analysis conducted using the retail model.

7. SUMMARY AND CONCLUSIONS

This report explains and illustrates how the retail impact model measures the sales effects of major retail development projects on existing and planned shopping centres in Edmonton. While there are some limitations to be considered in its application, the model provides a quantitative resource of these impacts and a means of assessing the sensitivity of a project proposal to changes in the project itself or the regional market centered in Edmonton.

The methods used to analyse market impacts in the model are recognized in academic literature, being based on research that began over 50 years ago. The methods also relate well to supply analysis studies prepared by retail industry analysts to assess the feasibility of retail facility development.

Recent model outputs for Edmonton, its urban market and specifically regional and community shopping centres are projected to continue to expand to serve locations where major market opportunities exist and adjust over time to maintain market shares and improve returns on investment. Five regional shopping centres: Londonderry, St. Albert Centre, West Edmonton, the Downtown and Mill Woods when it opens, are classified as above average performers over the long term. Heritage is expected to begin to perform at above average levels by 1996. Seven community shopping centres perform at above average levels: Eastgate and Fort Saskatchewan on a consistent basis over 20 years, North Town and Village Tree from 1988 on, Abbotsfield from 1988 to 1992 and the Spruce Grove and Lake District centres from 1993 and 2001 on respectively. They perform well because of their growing primary market areas and the appropriateness of their location with respect to each mall's trade area, new growth and competing shopping centres.

The retail impact model produces estimates of average sales per square metre of gross leasable area that are slightly below Canadian averages. While numerous factors influence this, the use of a methodology emphasizing relative analysis - evaluating performance in relation to the performance of other centres would appear to overcome this problem.

Mill Woods Town Centre

The market impact of the Mill Woods Town Centre proposal includes a significant negative impact on the Millbourne community shopping centre in Mill Woods. This level of impact is not unanticipated because both facilities have been included in development plans for Mill Woods since development began and will likely result in a role adjustment by Millbourne towards more of a convenience orientation. Lesser impacts are projected for Southgate, Bonnie Doon, Heritage and South Park Village. The model suggests that the development of the new Town Centre in Mill Woods will also have a positive impact on several north side shopping centres because of adjustments to trade area boundaries.

There are several limitations associated with the model design that must be considered when interpreting outputs from the model. They result from the scope of the variables used, the need to simplify certain complex inputs, the dynamics of the marketplace, the nature of consumers and the inability of analysts to compare actual outputs from the model to actual industry performance. To deal with these limitations, model output analysis is restricted to relative performance measures, interpretation criteria requires that negative impacts must achieve or exceed certain levels before any significance is attached to them and finally, any limitations to interpretation are specifically noted when and where applicable.

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APPENDIX A
Population by Zone
(thousands of persons)

Year	Zone Numbers																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1985	45.5	17.0	32.6	6.5	59.5	41.3	23.2	50.4	26.7	34.0	20.2	0.4	62.5	0.2	0.5	0.5	39.3	3.1
1986	44.9	16.7	32.3	6.7	58.9	40.9	23.0	50.0	26.5	33.6	19.9	0.7	64.4	0.2	0.5	0.5	40.3	3.9
1987	44.3	16.5	32.0	6.8	58.4	40.5	22.8	49.7	26.3	33.1	19.7	1.1	66.2	0.2	0.5	0.5	41.3	4.9
1988	43.7	16.2	31.7	6.9	57.8	40.1	22.5	49.3	26.1	32.7	19.4	1.8	67.8	0.2	0.5	0.5	42.4	5.9
1989	43.1	16.0	31.3	7.0	57.1	39.7	22.3	49.0	25.9	32.3	19.1	2.5	69.1	0.2	0.5	0.5	43.4	6.9
1990	42.6	15.8	31.0	7.0	56.5	39.3	22.1	48.6	25.7	31.9	18.9	3.3	70.5	0.2	0.5	0.5	44.6	8.1
1991	42.0	15.6	30.7	7.0	55.9	38.9	21.9	48.2	25.5	31.5	18.7	4.3	71.8	0.2	0.5	0.5	45.8	9.6
1992	41.5	15.4	30.3	7.0	55.3	38.5	21.7	47.8	25.3	31.1	18.4	5.4	73.1	0.2	0.5	0.5	46.9	11.0
1993	40.9	15.1	30.0	7.0	54.7	38.0	21.5	47.3	25.1	30.7	18.2	6.5	74.4	0.2	0.5	0.6	48.1	12.6
1994	40.7	15.1	29.9	7.0	54.4	37.8	21.4	47.1	25.0	30.6	18.1	7.5	75.6	0.2	0.5	0.6	49.0	13.7
1995	40.5	15.1	29.7	7.0	54.1	37.7	21.3	47.0	24.9	30.4	17.9	8.4	76.7	0.2	0.5	0.6	49.9	14.8
2000	39.2	15.1	29.0	7.0	52.6	36.7	20.7	45.8	24.4	29.5	17.4	12.8	82.0	0.2	0.5	0.6	53.6	19.8
2005	37.1	15.1	28.3	7.0	51.1	35.7	20.2	44.7	23.9	28.6	16.8	17.7	86.5	0.2	0.5	0.6	57.3	25.1

Year	Zone Numbers																
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1985	0.2	0.2	38.8	0.2	2.0	0.4	29.4	2.4	0.2	27.2	3.1	0.5	13.5	33.9	13.4	18.1	35.8
1986	0.2	0.2	41.0	0.3	2.0	0.8	30.3	3.0	0.3	28.0	3.1	0.5	13.7	34.5	13.6	18.4	36.4
1987	0.2	0.4	43.0	0.5	2.0	1.3	31.3	3.7	0.4	28.8	3.1	0.5	14.0	34.9	13.8	18.7	36.9
1988	0.2	0.5	44.9	0.9	2.0	1.8	32.2	4.1	0.8	29.5	3.1	0.5	14.2	35.4	14.0	19.0	37.4
1989	0.2	0.9	46.5	1.4	2.0	2.3	33.1	4.6	1.3	30.3	3.1	0.5	14.5	35.9	14.1	19.3	37.9
1990	0.2	1.5	47.9	2.1	2.0	2.9	33.8	5.1	1.7	31.1	3.1	0.5	14.7	36.3	14.3	19.6	38.5
1991	0.2	2.4	49.1	2.9	2.0	3.5	34.7	5.8	2.1	31.9	3.1	0.5	15.0	36.8	14.5	19.9	39.0
1992	0.2	3.4	50.1	3.9	2.0	4.1	35.7	6.3	2.7	32.7	3.1	0.5	15.2	37.3	14.7	20.2	39.5
1993	0.2	4.6	50.9	5.1	2.0	4.5	36.9	6.9	3.3	33.5	3.1	0.5	15.5	37.8	14.9	20.5	40.1
1994	0.2	5.5	51.5	6.0	2.1	5.5	37.2	7.5	3.8	34.2	3.1	0.5	15.7	38.3	15.0	20.8	40.6
1995	0.2	6.4	52.1	6.9	2.1	6.2	37.7	8.0	4.3	34.8	3.1	0.5	16.0	38.8	15.2	21.1	41.2
2000	0.2	10.5	55.0	10.9	2.1	9.2	40.3	10.9	6.3	37.9	3.1	0.5	18.8	41.8	16.0	22.6	44.3
2005	0.2	14.9	57.5	15.1	2.1	11.9	43.2	13.9	8.5	40.6	3.1	0.5	21.6	44.4	17.1	24.2	47.7

Source: Edmonton Planning and Building Department, Population Projections - Corporate Forecasting Group November 1985

Note: See Map 1 for zone boundaries

APPENDIX B
Shopping Centre Sizes
(thousands of square metres)

	Centre Numbers																
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1985	35.3	15.0	0.0	26.9	50.2	0.0	66.4	0.0	13.2	0.0	13.8	14.0	0.0	29.7	43.6	0.0	0.0	17.2
1986	35.3	15.0	0.0	26.9	50.2	0.0	66.4	0.0	13.2	0.0	13.8	16.4	0.0	29.7	43.6	0.0	0.0	17.2
1987	35.3	15.0	0.0	26.9	50.2	0.0	66.4	0.0	13.2	0.0	13.8	16.4	0.0	29.7	43.6	0.0	0.0	17.2
1988	35.3	15.0	0.0	26.9	50.2	0.0	66.4	0.0	13.2	0.0	13.8	16.4	0.0	29.7	43.6	0.0	42.5	17.2
1989	35.3	15.0	0.0	26.9	50.2	0.0	66.4	0.0	13.2	0.0	13.8	16.4	0.0	29.7	43.6	0.0	42.5	17.2
1990	35.3	15.0	0.0	26.9	50.2	0.0	66.4	0.0	13.2	0.0	13.8	16.4	0.0	29.7	43.6	0.0	42.5	17.2
1991	35.3	15.0	0.0	26.9	50.2	0.0	66.4	0.0	13.2	0.0	13.8	16.4	0.0	29.7	43.6	0.0	42.5	17.2
1992	35.3	15.0	0.0	26.9	50.2	0.0	66.4	0.0	13.2	0.0	13.8	16.4	0.0	29.7	43.6	0.0	42.5	17.2
1993	35.3	15.0	0.0	26.9	50.2	0.0	66.4	0.0	13.2	0.0	13.8	16.4	0.0	29.7	43.6	0.0	59.3	17.2
1994	35.3	15.0	0.0	26.9	50.2	0.0	66.4	0.0	13.2	0.0	13.8	16.4	0.0	29.7	43.6	0.0	59.3	17.2
1995	35.3	15.0	15.0	26.9	50.2	0.0	66.4	0.0	13.2	0.0	13.8	16.4	0.0	29.7	43.6	0.0	59.3	17.2
2000	35.3	15.0	15.0	26.9	50.2	17.0	66.4	0.0	13.2	0.0	13.8	16.4	0.0	29.7	43.6	0.0	59.3	17.2
2005	35.3	15.0	15.0	26.9	50.2	17.0	66.4	0.0	13.2	0.0	13.8	16.4	0.0	29.7	43.6	0.0	59.3	17.2

	Centre Numbers															
Year	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1985	0.0	0.0	10.0	66.9	73.8	0.0	0.0	0.0	0.0	353.0	27.4	30.7	51.5	56.2	110.0	0.0
1986	0.0	0.0	10.0	66.9	73.8	0.0	0.0	0.0	0.0	353.0	27.4	30.7	51.5	58.6	110.0	0.0
1987	0.0	0.0	10.0	66.9	73.8	0.0	0.0	0.0	0.0	353.0	27.4	30.7	51.5	58.6	112.8	0.0
1988	0.0	0.0	10.0	66.9	73.8	0.0	0.0	0.0	0.0	353.0	27.4	30.7	51.5	58.6	122.3	0.0
1989	0.0	0.0	10.0	66.9	73.8	0.0	0.0	0.0	0.0	353.0	27.4	30.7	51.5	58.6	169.3	0.0
1990	0.0	0.0	10.0	66.9	73.8	0.0	0.0	0.0	0.0	353.0	27.4	30.7	51.5	58.6	169.3	0.0
1991	0.0	0.0	10.0	66.9	73.8	0.0	0.0	0.0	0.0	353.0	27.4	30.7	51.5	58.6	169.3	0.0
1992	0.0	0.0	10.0	66.9	73.8	0.0	0.0	0.0	0.0	353.0	27.4	30.7	51.5	58.6	169.3	0.0
1993	0.0	0.0	10.0	66.9	73.8	0.0	0.0	0.0	0.0	353.0	27.4	30.7	51.5	58.6	169.3	0.0
1994	0.0	0.0	10.0	66.9	73.8	0.0	0.0	0.0	0.0	353.0	27.4	30.7	51.5	58.6	169.3	0.0
1995	0.0	0.0	10.0	66.9	73.8	0.0	0.0	0.0	0.0	353.0	27.4	30.7	51.5	58.6	169.3	0.0
2000	0.0	0.0	10.0	66.9	73.8	0.0	0.0	0.0	0.0	353.0	27.4	30.7	51.5	58.6	169.3	0.0
2005	0.0	0.0	10.0	66.9	73.8	0.0	0.0	0.0	0.0	353.0	27.4	30.7	51.5	58.6	169.3	0.0

Source: Urbanics Consultants Ltd., Vancouver, 1983 and Edmonton Planning and Building Department, October 1986

Note: See Map 1 for shopping centre locations

APPENDIX C
Anchor Tenants by Shopping Centre

Year	Centre Numbers																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1985	BC	Z		K	WZ		BEC		K			Z		C	S			Z
1986	BC	Z		K	WZ		BEC		K			Z		C	S			Z
1987	BC	Z		K	WZ		BEC		K		Z	Z		C	S			Z
1988	BC	Z		K	WZ		BEC		K		Z	Z		C	S		WC	Z
1989	BC	Z		K	WZ		BEC		K		Z	Z		C	S		WC	Z
1990	BC	Z		K	WZ		BEC		K		Z	Z		C	S		WC	Z
1991	BC	Z		K	WZ		BEC		K		Z	Z		C	S		WC	Z
1992	BC	Z		K	WZ		BEC		K		Z	Z		C	S		WCB	Z
1993	BC	Z		K	WZ		BEC		K		Z	Z		C	S		WCB	Z
1994	BC	Z		K	WZ		BEC		K		Z	Z		C	S		WCB	Z
1995	BC	Z	X	K	WZ		BEC		K		Z	Z		C	S		WCB	Z
2000	BC	Z	X	K	WZ	Z	BEC		K		Z	Z		C	S		WCB	Z
2005	BC	Z	X	K	WZ	Z	BEC		K		Z	Z		C	S		WCB	Z

Year	Centre Numbers															
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1985			X	BW	ESC					BESWZ	KZ	C	W	SZ	BEW	
1986			X	BW	ESC					BESWZ	KZ	C	W	SZ	BEW	
1987			X	BW	ESC					BESWZ	KZ	C	W	SZ	BEW	
1988			X	BW	ESC					BESWZ	KZ	C	W	SZ	BEW	
1989			X	BW	ESC					BESWZ	KZ	C	W	SZ	BEWZ	
1990			X	BW	ESC					BESWZ	KZ	C	W	SZ	BEWZ	
1991			X	BW	ESC					BESWZ	KZ	C	W	SZ	BEWZ	
1992			X	BW	ESC					BESWZ	KZ	C	W	SZ	BEWZ	
1993			X	BW	ESC					BESWZ	KZ	C	W	SZ	BEWZ	
1994			X	BW	ESC				K	BESWZ	KZ	C	W	SZ	BEWZ	
1995			X	BW	ESC				K	BESWZ	KZ	C	W	SZ	BEWZ	
2000			X	BW	ESC	EK			K	BESWZ	KZ	C	W	SZ	BEWZ	
2005			X	BW	ESC	EK			K	BESWZ	KZ	C	W	SZ	BEWZ	

* A blank indicates no anchor tenant for the centre.
B=Hudson Bay, C=Woolco, Z=Zellers, K=K-Mart, W=Woodward's, E=Eatons, S=Sears, X=Other
Source: Urbanics Consultants Ltd., Vancouver, 1983, and Edmonton Planning and Building Department, 1986.

APPENDIX D
Estimated Travel Times from Zone 1 to Each Centre
(minutes)

	Centre Numbers																	
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1985	16	13	12	7	7	12	10	11	10	14	19	16	14	7	6	18	15	12
1986	16	13	12	7	7	12	10	11	10	14	19	16	14	7	6	18	15	12
1987	16	13	12	7	7	12	10	11	10	14	19	16	14	7	6	18	15	12
1988	16	13	12	7	7	12	10	11	10	14	19	16	14	7	6	18	15	12
1989	16	13	12	7	7	12	10	11	10	14	19	16	14	7	6	18	15	12
1990	16	13	12	7	7	12	10	11	10	14	19	16	14	7	6	18	15	12
1991	16	13	12	7	7	12	10	11	10	14	19	16	14	7	6	18	15	12
1992	16	13	12	7	7	12	10	11	10	14	19	16	14	7	6	18	15	12
1993	16	13	12	7	7	12	10	11	10	14	19	16	14	7	6	18	15	12
1994	16	13	12	7	7	12	10	11	10	14	19	16	14	7	6	18	15	12
1995	16	13	12	7	7	12	10	11	10	14	19	16	14	7	6	18	15	12
2000	16	13	12	7	7	12	10	11	10	14	19	16	14	7	6	18	15	12
2005	16	13	12	7	7	12	10	11	10	14	19	16	14	7	6	18	15	12

	Centre Numbers															
Year	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1985	14	18	9	10	12	10	20	14	15	10	8	8	4	2	2	0
1986	14	18	9	10	12	10	20	14	15	10	8	8	4	2	2	0
1987	14	18	9	10	12	10	20	14	15	10	8	8	4	2	2	0
1988	14	18	9	10	12	10	20	14	15	10	8	8	4	2	2	0
1989	14	18	9	10	12	10	20	14	15	10	8	8	4	2	2	0
1990	14	18	9	10	12	10	20	14	15	10	8	8	4	2	2	0
1991	14	18	9	10	12	10	20	14	15	10	8	8	4	2	2	0
1992	14	18	9	10	12	10	20	14	15	10	8	8	4	2	2	0
1993	14	18	9	10	12	10	20	14	15	10	8	8	4	2	2	0
1994	14	18	9	10	12	10	20	14	15	10	8	8	4	2	2	0
1995	14	18	9	10	12	10	20	14	15	10	8	8	4	2	2	0
2000	14	18	9	10	12	10	20	14	15	10	8	8	4	2	2	0
2005	14	18	9	10	12	10	20	14	15	10	8	8	4	2	2	0

Source: Edmonton Planning and Building Department, 1986

APPENDIX E

Intervening Centres Between Zone 1 and Each Destination Centre

DEST.	Intervening Centre Numbers																																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N
2	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N
3	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
4	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
5	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
6	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
7	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N
8	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N
9	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
10	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N
11	N	N	N	N	N	N	Y	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N
12	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N
13	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
14	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
15	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
16	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
17	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
18	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
19	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N
20	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
21	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N
22	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
23	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N
24	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
25	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
26	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N
27	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N
28	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
29	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
30	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
31	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
32	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
33	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
34	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

*Dest.=Destination Shopping Centre
N = No, Y=Yes
Source: Edmonton Planning and Building Department, 1986.

APPENDIX F

Per Capita Centre Income Indices by Zone
(Edmonton CMA = 1.000)

Zone Number	Income Index
1	1.070
2	1.204
3	1.139
4	1.545
5	1.108
6	0.838
7	0.887
8	0.872
9	0.895
10	1.092
11	1.000
12	0.900
13	0.902
14	0.950
15	0.900
16	1.100
17	1.263
18	1.478
19	1.050
20	1.050
21	1.108
22	1.050
23	1.000
24	1.000
25	0.961
26	0.950
27	0.950
28	0.862
29	0.900
30	0.900
31	0.955
32	0.996
33	0.906
34	0.954
35	1.025

Source: Statistics Canada, 1981 Census and Urbanics Consultants Ltd., Vancouver, 1983.

APPENDIX G

Shopping Centre Market Shares by Zone, 1986
(percent of total sales)

Zone	Centre Numbers																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	0.29	0.11	0.00	0.34	1.65	0.00	0.77	0.00	0.10	0.00	0.00	0.07	0.00	0.39	0.84	0.00	0.00	0.10
2	0.67	0.26	0.00	0.57	1.82	0.00	0.93	0.00	0.12	0.00	0.00	0.23	0.00	1.17	8.17	0.00	0.00	1.08
3	0.58	0.22	0.00	0.33	1.60	0.00	1.13	0.00	0.16	0.00	0.00	0.27	0.00	1.01	6.34	0.00	0.00	0.41
4	0.62	0.24	0.00	0.19	0.92	0.00	0.42	0.00	0.05	0.00	0.00	0.13	0.00	0.64	0.97	0.00	0.00	0.36
5	1.10	0.49	0.00	0.26	1.35	0.00	0.66	0.00	0.05	0.00	0.00	0.11	0.00	0.27	2.03	0.00	0.00	0.16
6	2.00	0.89	0.00	2.09	14.89	0.00	12.99	0.00	0.78	0.00	0.00	0.63	0.00	2.68	1.07	0.00	0.00	0.13
7	2.88	1.41	0.00	9.88	31.51	0.00	7.35	0.00	0.35	0.00	0.00	0.56	0.00	1.82	0.56	0.00	0.00	0.10
8	0.57	0.22	0.00	4.13	13.16	0.00	60.25	0.00	0.25	0.00	0.00	0.16	0.00	0.50	0.55	0.00	0.00	0.22
9	0.80	0.30	0.00	3.06	9.75	0.00	23.81	0.00	3.74	0.00	0.00	1.08	0.00	4.51	4.29	0.00	0.00	0.37
10	0.33	0.11	0.00	0.95	6.77	0.00	12.91	0.00	0.81	0.00	0.00	0.81	0.00	13.68	12.53	0.00	0.00	0.51
11	0.20	0.07	0.00	0.14	0.55	0.00	1.26	0.00	0.25	0.00	0.00	0.42	0.00	2.64	36.90	0.00	0.00	0.99
12	0.52	0.18	0.00	0.71	4.12	0.00	6.83	0.00	1.48	0.00	0.00	2.30	0.00	4.16	9.52	0.00	0.00	3.39
13	0.97	0.35	0.00	0.26	1.04	0.00	3.50	0.00	0.50	0.00	0.00	1.10	0.00	3.33	8.70	0.00	0.00	7.64
14	0.85	0.29	0.00	0.52	2.48	0.00	6.57	0.00	1.05	0.00	0.00	1.58	0.00	3.23	6.21	0.00	0.00	4.09
15	0.53	0.18	0.00	0.34	1.34	0.00	3.91	0.00	0.63	0.00	0.00	1.39	0.00	2.37	5.78	0.00	0.00	4.35
16	0.12	0.04	0.00	0.24	1.16	0.00	0.77	0.00	0.05	0.00	0.00	0.13	0.00	0.25	0.63	0.00	0.00	0.24
17	0.19	0.07	0.00	0.07	0.27	0.00	0.42	0.00	0.06	0.00	0.00	0.07	0.00	0.28	0.74	0.00	0.00	1.21
18	0.67	0.25	0.00	0.24	1.15	0.00	0.47	0.00	0.08	0.00	0.00	0.14	0.00	0.37	1.11	0.00	0.00	0.30
19	1.46	0.59	0.00	0.05	0.18	0.00	0.25	0.00	0.08	0.00	0.00	0.13	0.00	0.57	0.76	0.00	0.00	0.20
20	1.43	0.59	0.00	0.06	0.20	0.00	0.20	0.00	0.02	0.00	0.00	0.17	0.00	0.44	2.01	0.00	0.00	0.24
21	0.05	0.02	0.00	0.02	0.07	0.00	0.08	0.00	0.01	0.00	0.00	0.01	0.00	0.02	0.06	0.00	0.00	0.10
22	1.61	0.70	0.00	0.27	1.26	0.00	1.11	0.00	0.05	0.00	0.00	0.02	0.00	0.07	0.17	0.00	0.00	0.05
23	3.17	1.15	0.00	1.74	5.54	0.00	2.51	0.00	0.25	0.00	0.00	0.08	0.00	0.22	1.17	0.00	0.00	0.17
24	3.64	1.78	0.00	4.17	13.30	0.00	5.17	0.00	0.20	0.00	0.00	0.26	0.00	0.73	0.59	0.00	0.00	0.11
25	5.20	1.97	0.00	8.64	19.88	0.00	9.18	0.00	0.32	0.00	0.00	0.22	0.00	1.14	0.67	0.00	0.00	0.11
26	4.52	1.60	0.00	7.87	18.10	0.00	31.90	0.00	0.63	0.00	0.00	0.43	0.00	1.10	0.86	0.00	0.00	0.14
27	4.71	1.62	0.00	2.09	5.89	0.00	46.92	0.00	2.76	0.00	0.00	1.83	0.00	1.66	2.83	0.00	0.00	0.31
28	0.59	0.21	0.00	1.29	4.11	0.00	28.90	0.00	6.80	0.00	0.00	1.44	0.00	2.50	3.22	0.00	0.00	0.73
29	3.81	1.24	0.00	1.51	4.25	0.00	30.56	0.00	2.16	0.00	0.00	1.46	0.00	3.44	3.99	0.00	0.00	0.79
30	5.48	1.80	0.00	4.45	10.24	0.00	26.30	0.00	2.04	0.00	0.00	1.80	0.00	3.77	2.21	0.00	0.00	0.65
31	5.18	1.71	0.00	1.17	5.45	0.00	30.48	0.00	1.75	0.00	0.00	1.40	0.00	3.60	3.89	0.00	0.00	1.79
32	0.86	0.30	0.00	1.65	5.27	0.00	9.20	0.00	1.98	0.00	0.00	21.08	0.00	3.91	7.16	0.00	0.00	1.63
33	0.37	0.12	0.00	0.15	0.55	0.00	1.27	0.00	0.33	0.00	0.00	0.85	0.00	1.20	4.22	0.00	0.00	2.18
34	2.09	0.72	0.00	0.97	3.08	0.00	1.40	0.00	0.09	0.00	0.00	0.02	0.00	0.28	0.17	0.00	0.00	0.04
35	37.56	5.48	0.00	1.43	4.57	0.00	2.35	0.00	0.09	0.00	0.00	0.12	0.00	0.43	0.28	0.00	0.00	0.23

Source: Edmonton Planning and Building Department, Retail Impact Model, October 1986.

Note: See Map 1 for zone boundaries and shopping centre locations

Interpretation: This table shows the market share assigned by the model to each shopping centre from each residential zone in the City, taking into account all of the inputs to the model. The market share is the percentage of the total DSTM expenditures generated by the zone in question. For example 13.16 percent of the DSTM dollars spent by zone 8 residents are spent at Northwood Shopping Mall (Centre #5).

APPENDIX H
General Shopping Centre Data

DSTM Growth Rate (%)	1.0
Base Year DSTM ($)	2,250
SC Share of DSTM (%)	80

Source: Urbanics Consultants Ltd., Vancouver, 1983 and
Development Consulting Group Ltd., Vancouver, 1986.